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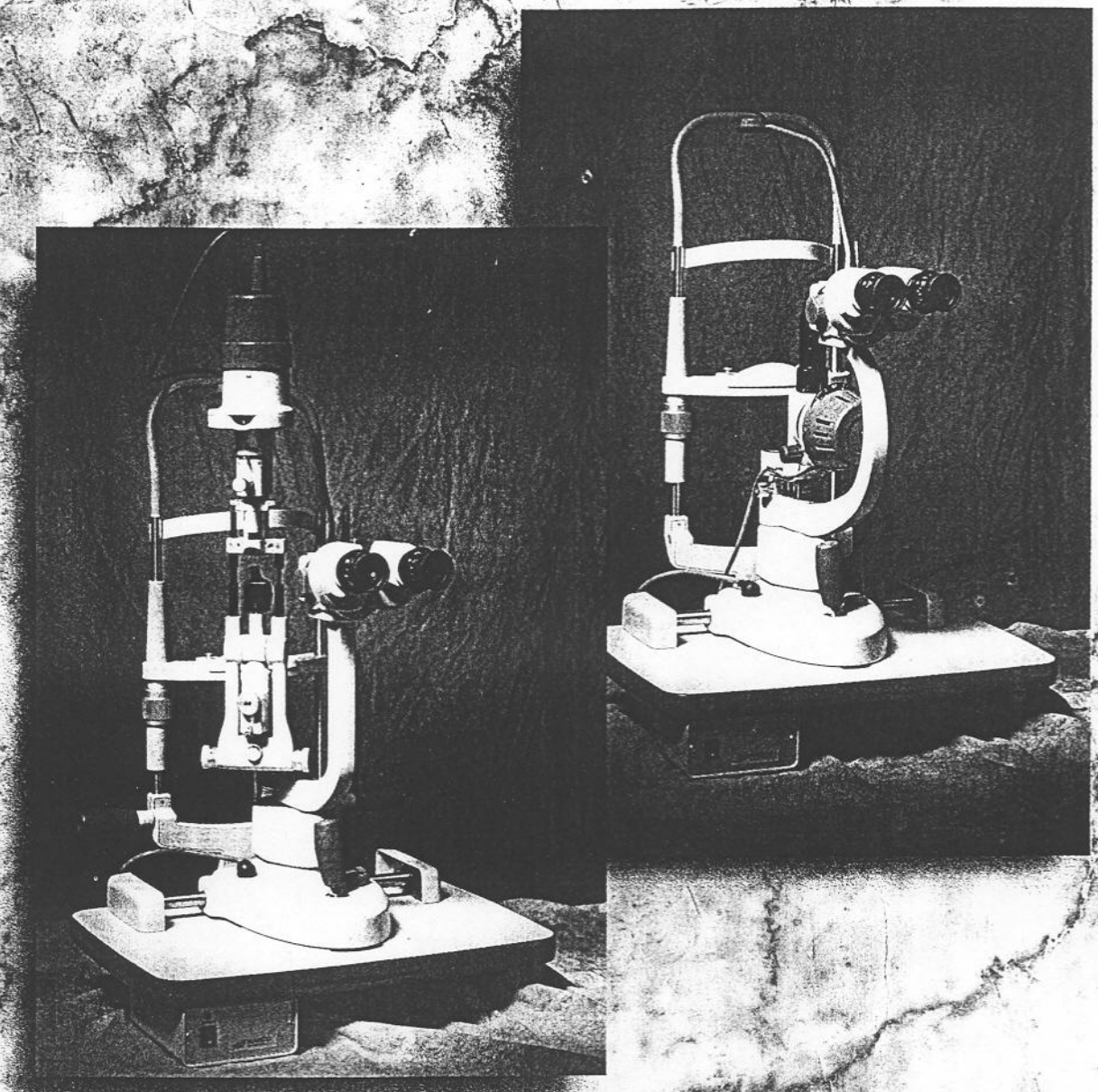

ULTRA SLIT LAMP BIOMICROSCOPE INSTRUCTION MANUAL

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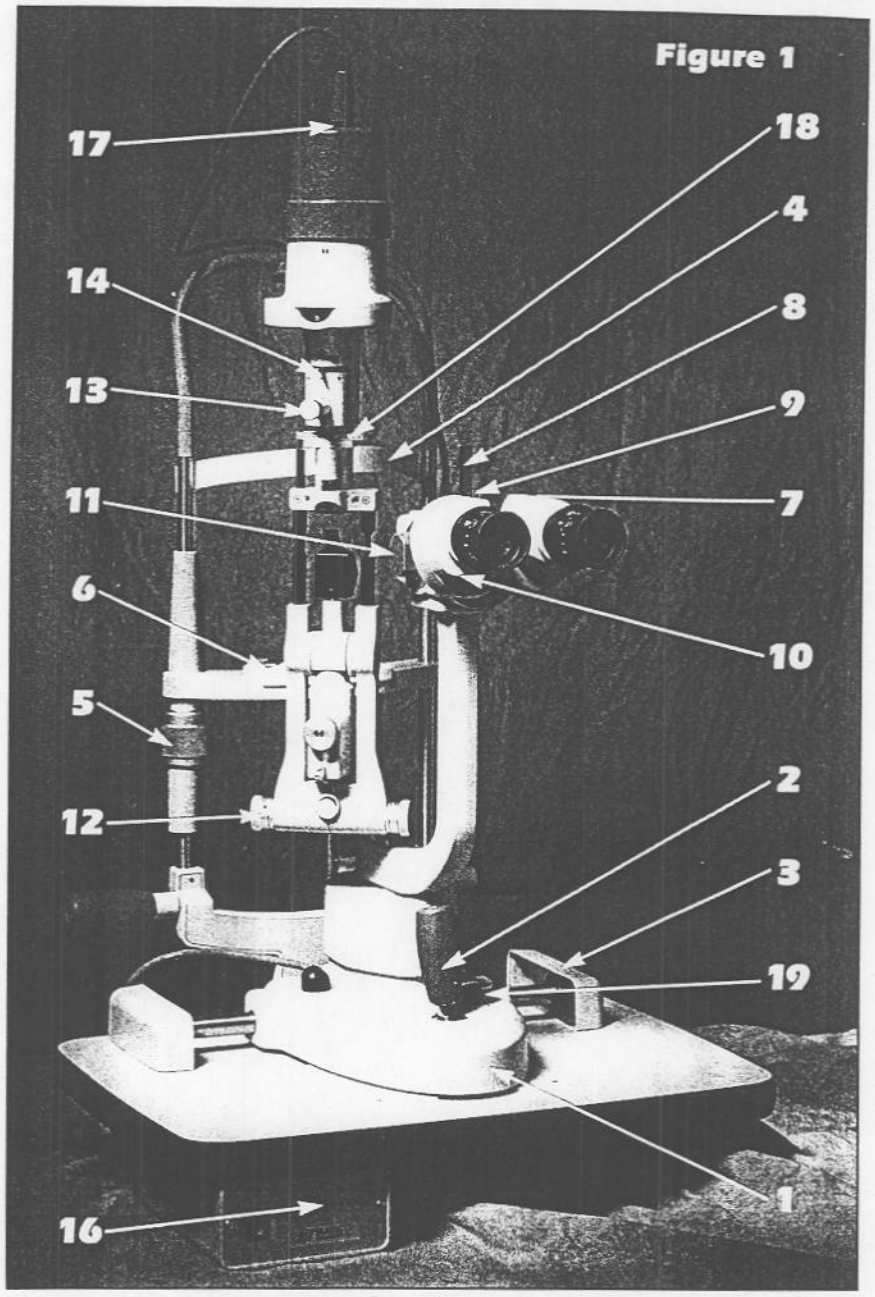


Same part labels apply to models 5 and 2b.

GENERAL DESCRIPTION:

The Ultra series of slit lamps from Marco is the result of many years of extensive product research and delicate engineering. The Ultra series introduces a quantum leap in optical technology and manufacturing techniques in a more ergonometric and modern design. Each slit lamp maintains an attractive, sophisticated appearance with a variety of features suited for many individual preferences.

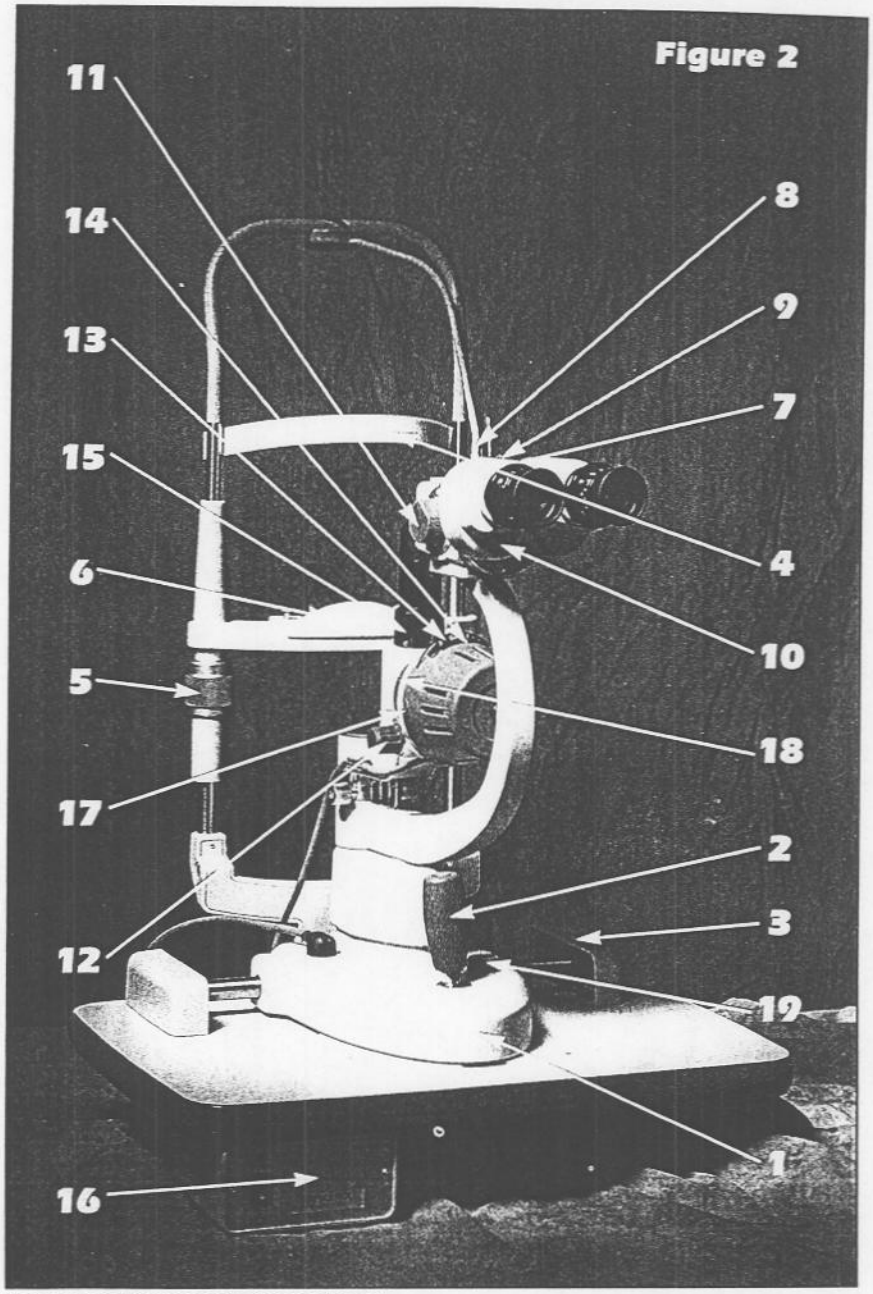
Optically, you will enjoy the very latest in materials and lens coating technology that filters light more efficiently, resulting in a 20% increase in optical resolution and clarity. This end-result is a dramatic and significant breakthrough in total image quality.

Many options are available on specific Ultra slit lamps, including observation tubes and a variety of video cameras.

This instruction manual provides a detailed breakdown of each Ultra model slit lamp component, information on how to install the slit lamps, basic slit lamp illumination and examination techniques, and general care and maintenance. Please use this instruction manual as an overall reference guide. For more detailed information, contact your authorized Marco distributor or Marco Ophthalmic directly.

Figure 1 & 2

1. Base
2. Joystick/Elevation Control
3. Rail Cover
4. Headrest
5. Headrest Elevation Control
6. Chinrest
7. Eye Level Marker (not visible)
8. Fixation Light
9. Ocular Head Locking Knob
10. Ocular Head
11. Magnification Power Knob
12. Slit Width Control
13. Slit Aperture Control
14. Filter Control
15. Scan Ring (G4 & G2 only)
16. Transformer
17. Lamp Housing Screw
18. Slit Rotation Index
19. Rheostat



Same part labels apply to model G2.

INSTALLATION

The installation of each model Ultra series slit lamp follows the same basic procedure. Please review the following assembly instructions carefully during set-up.

1. Turn the slit lamp box upside down and lift it off the styrofoam inner packing. Leave the packing upside down.
2. Remove the top lid of the styrofoam packing.
3. Remove the table top and install on an instrument stand. If mounting on a previously assembled instrument table, make sure the appropriate mounting bracket has been installed.
4. Turn the styrofoam packing completely over and open the top lid.
5. Install the patient headrest and remove the accessory kit. Make sure to run the headrest cables through the headrest bracket. On the models 5 and G5, install the patient handrests (Optional on models G2, G4, and 2b).
6. Separate the middle section of the styrofoam packing. Remove the slit lamp base assembly and carefully insert the slide bar. Attach the gear rollers to each end of the slide bar, place the base on the table top and "snap in" the rack covers. On the models 2b, 5, and G5, install and secure the tower light source.
7. Remove the oculars (G2, G4, G5) and mount on the microscope head, tightening the thumb screw securely. If installing a model 2b or 5, mount the microscope head to the microscope arm using the attached angled screw. Please be certain to align this screw carefully to avoid stripping the threads in the microscope head.
8. Attach the fixation device to the fixation LED and insert the cap that covers the hole on the slit lamp base (these components are found in the accessory box).
9. Attach all electrical connections to the transformer and plug the instrument into a standard 110v/60hz grounded outlet.

SLIT LAMP ILLUMINATION TECHNIQUES

The slit lamp examination is a smooth, continuum of various special illumination techniques. The various techniques will be described as static positions in order to set them up with your new Marco Slit Lamp Biomicroscope. Once the appearance of each structure with each illumination technique has been recognized, the mechanics of setting up these techniques will fade from the procedure. It will become automatic.

Diffuse Illumination (Diagram 1)

1. The illumination system is set with the widest slit width and the longest slit aperture. The biomicroscope is placed on 10x magnification. The angle between these two subsystems should be about 45°.
2. This procedure is used to give an overall view of the eye. It is not used for detailed viewing of specific areas but rather for locating areas to be viewed in detail. It is good for locating corneal scars, folds, tears, vascularization, or edema.

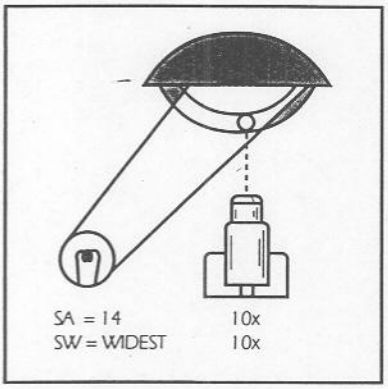


Diagram 1
Diffuse Illumination

Sclerotic Scatter Illumination (Diagram 2)

1. The biomicroscope is placed on 10x magnification and focused on the cornea. The illumination system is taken out of center and a medium-width slit is focused on the limbus. The illumination system focuses on the same location as the biomicroscope. Occasionally, a special illumination technique requires the illumination system to be taken out of center by moving the scan ring to a position left or right from the biomicroscope focal plane.

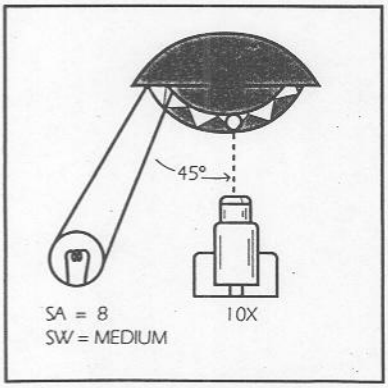


Diagram 2
Sclerotic Scatter

2. This procedure is used for the observation of the corneal transparency, or the lack thereof. Corneal scars, pigmentation, edema, deposits or folds can be seen. This is an excellent technique for locating any corneal opacity. The abnormalities interfere with the internally reflected light causing the abnormality to appear whiter.

Direct Focal Illumination (Diagram 3, 4 and 5)

1. The illumination system is centered. The angle between the illumination system and the biomicroscope can be from 45° to 50°. Three basic illumination techniques may be obtained by varying the width and the aperture size of the light.

   The optic section is obtained by using the widest aperture size and the narrowest possible slit width. With each of these illumination techniques the biomicroscope is focused on the structure of regard.

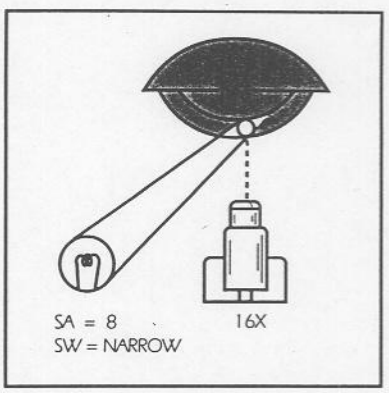


Diagram 3
Optic Section

2. The optic section (Diagram 3) is used to view the cornea, the lens, and the iris. It is useful for determining the depth of foreign bodies or opacities. It is also useful for visualizing the contour of the iris, conjunctiva, or cornea or note lumps or growths.

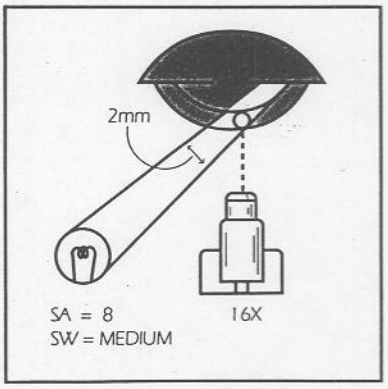


Diagram 4
Parallelpiped

The parallelpiped (Diagram 4) is useful for viewing a wider section of the cornea, lens, iris, or conjunctiva. It allows one to view both the anterior and the posterior surfaces of the cornea simultaneously. It is the illumination technique used most frequently during a general survey of the eye.

The conical beam (Diagram 5) is used to determine presence of aqueous flare. The conical beam, like a searchlight, is shown through the aqueous into the pupil. The biomicro-

scope is focused in the anterior chamber. Select 16x on the magnification power changer. The observer should be dark adapted; but in cases of acute uvitis, the flare is observable without this timely procedure. For best results, rock the joystick back and forth. Appreciable flare indicates a pathological state.

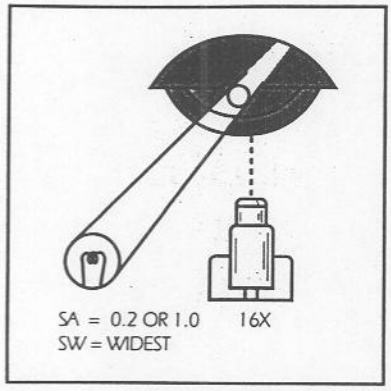


Diagram 5
Conical Beam

Indirect Illumination (Diagram 6)

1. The biomicroscope may be on 10x or 16x magnification. The illumination system is "out of clic" (away from the center)

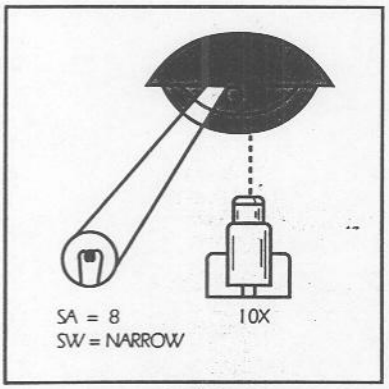


Diagram 6
Indirect Illumination

and moved to the side of the biomicroscope focal plane. The illumination is adjacent to the structure being viewed.

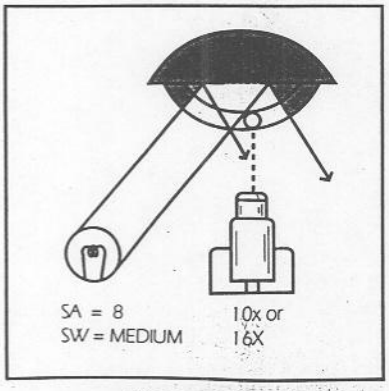


Diagram 7
Retro Illumination

2. This illumination technique is useful for studying iris or fine vessels of the cornea.

Retro-Illumination (Diagram 7)

1. The biomicroscope may be on 10x or 16x magnification and should be focused on the opacity being observed. The illumination system is "out of clic" and moved to the side of the observed corneal abnormality so that the light reflects off the iris. The reflected light returns from the iris and retro-illuminates the opacity.

2. Retro-illumination is especially useful for studying deposits on the posterior surface of the cornea, corneal vascularization, corneal edema and corneal scars. Although difficult to obtain, the retro-illumination of the crystalline lens provides an excellent view of cortical and anterior opacities.

Specular Reflection Illumination (Diagram 8)

1. The illumination system is centered and positioned about 30° to the side of the patient's line of sight. The biomicroscope may be on 10x or 16x magnification and focused on the corneal epithelium or endothelium. The biomicroscope is positioned about 30° to the opposite side of the patient's line if sight. The angle between the illumination system and the biomicroscope is about 60° for the corneal surfaces. The patient's line of sight bisects this angle. For the lens surfaces, the total angle will be about 30° or 40°, and the patient's line of sight will bisect this angle. As the surface focused upon is viewed, that surface is viewed in specular reflection.

2. Specular reflection of the corneal epithelium appears as a mirror-like reflection. The integrity of the surface is easily evaluated. Specular reflection of the corneal endothelium appears as a small brown patch of hexagonal cells with black spaces that vary in number and size. This surface will present excrescences in corneal guttate or Fuch's dystrophy. The crystalline lens has an anterior surface which appears like a silver orange peel when seen in specular reflection. Changes in this surface are readily seen. The posterior subcapsular opacification can be evaluated with this illumination technique.

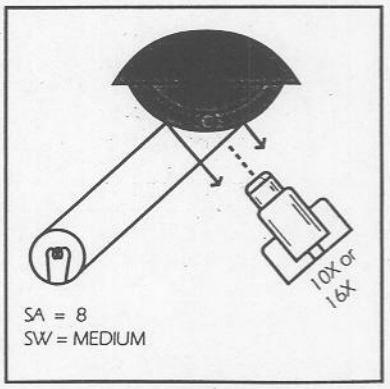


Diagram 8
Specular Reflection

An examination consists of a synchronized succession of all of the special illumination techniques. As the eye is examined, move smoothly from one technique to another. Keep one hand on the joystick. The other hand may remain free to control the slit width, the position of the illumination system, the biomicroscope, or the patient. Either hand can be used to change filter color, magnification, slit aperture size, and the patient's head height. This type of control is termed bimanual operation. It is the ultimate in efficiency.

BASIC SLIT LAMP EXAMINATION

The basic examination of the eye consists of a systematic evaluation of each major structure. Any logical sequence can be used during the basic slit lamp examinations. The following is a step-by-step example of an organized slit lamp examination. Once the basic techniques have been mastered, procedures may be modified to suit personal needs.

1. Have the patient place his/her chin on the chinrest and the forehead against the forehead band. Adjust the height of the patient's head with the headrest elevation control to the point where the eye corresponds with the eye level marker on the headrest upright. The slit lamp table should be positioned in such a way to assure patient comfort and stability.
2. Place the magnification knob on the lowest power. Set the illumination system about 45° to the temporal side of the eye intended for examination. Turn on the slit lamp and adjust the intensity to the lowest setting possible that provides adequate levels of illumination. Adjust the slit width to a medium width, and the slit height to the maximum height available. Select white light with the filter wheel.
3. Position the slit lamp light by moving the slit lamp base, so that the medium-width slit comes into focus on the patient's outer canthus. Look into the biomicroscope. Make fine adjustments in height and focus with the joystick.
4. Begin a gross survey of the ocular adnexa by moving along the upper lid toward the medial canthus. Survey the lid margin, lashes and the lid proper. While crossing the midline of the eye, swing the illumination system to the opposite side of the biomicroscope. A general rule to follow: when viewing the temporal half of the eye, the illumination system should be on the temporal side of the biomicroscope. Conversely, while viewing the nasal half, move the illumination system to the nasal side of the biomicroscope. After reaching the medial canthus, lower the slit lamp with the joystick and survey the lower lid until arriving at the lateral canthus again.
5. Having surveyed the outer aspects of the lids, invert the lids–one at a time–and repeat the same general pattern. The upper lid should be inverted with one hand. This will take some practice before the technique is mastered. The lower lid is simply pulled down with the thumb. Survey the conjunctival lining of lids and the tarsal plates.
6. Once the lids have been surveyed, remain at the lateral canthus. Move the slit lamp with the medium-width slit until the slit is on the temporal limbus. The cornea will have the characteristic glow of the sclerotic scatter illumination technique. The cornea may be viewed by looking over the biomicroscope, not through it. Scan for corneal abnormalities. Any abnormalities noted may be carefully surveyed while moving across the cornea.
7. Now look through the biomicroscope and notice a parallelpiped section of the limbus. Using the joystick move across the cornea slowly. Carefully review any abnormalities noted in step number 7. Remember to swing the illumination system to the nasal side crossing the midline. Survey the entire cornea.
8. Once the cornea has been surveyed, move to the medial limbus. Begin a survey of the iris from this position. Move slowly across the iris noting any bumps, vascularization, unusual pigmentation, or abnormalities.
9. The final structure to be surveyed during a basic examination is the crystalline lens. Beginning at the temporal edge of the pupil, survey in two directions; laterally and inward. Examine the anterior and posterior aspects of the crystalline lens in specular reflection, and examine the lens cortex with a parallelpiped section.
10. Repeat the process on the other eye.

HRUBY LENS FUNDUS EXAMINATION

The examination of the fundus with the Hruby lens (optional) attached to the Slit Lamp Biomicroscope provides the examiner with a stereoscopic view of lesions noted during ophthalmoscopy. The differential diagnosis of choroidal pigmented lesions is greatly aided by this type of examination. The pupil should be dilated to any adequate size prior to commencing with this type of examination.

1. The biomicroscope is placed in the central position (straight ahead) and the magnification is placed on 10x . The illumination system is also placed in the central position.
2. Focus a narrow slit of light on the cornea.
3. Position the Hruby Lens by inserting the Hruby shaft into the slide plate. Move the base toward the patient until the lens hits the lens bumper. Now center on the eye.
4. Make fine focus adjustments by moving the joystick until the fundus is in clear sharp focus. The illumination system may now be positioned off center by about 10°.
5. Survey the fundus lesion by moving the patient's fixation in a direction that will bring the lesion into view. The eye would have to be fixating in an up and outward position.
6. The prismatic effects of the high minus lens can be used effectively to view the more peripheral retinal lesions.

OPTIONAL ACCESSORIES

All Marco Ultra slit lamps accept standard applination tonometers and hruby lens assemblies. The models G2, G4, and G5 have the capability of mounting assistantscope kits and video accessories.

MAIN ILLUMINATION BULB REPLACEMENT

1. Always turn the unit off before replacing the bulb. Loosen the thumb screw located on the lamp housing and remove the lamp cover (2B, 5, G5 lamp covers are located on top, G2, G4 covers are located in front). **Please be careful of a hot bulb and socket.**
2. Slide the retaining ring to one side of the lamp socket.
3. Pull the lamp socket and bulb out from the lamp housing.
4. Remove the old bulb and insert a new halogen bulb being careful not to touch the bulb directly with your fingers. Use a tissue or some other soft material.
5. Secure with the retaining ring and replace the lamp housing.

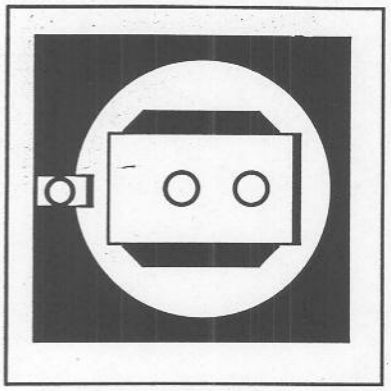


FIGURE 3

CARE AND MAINTENANCE

Marco Slit Lamp Biomicroscopes should be given the care required of all precision instruments. The plastic dust cover should be used whenever the instrument is not in use. Periodic dusting with the soft dust cloth or brush is recommended. Frequent transportation of the instrument may shorten bulb life but will not damage the instrument itself. With a little care, the Marco Slit Lamp Biomicroscope will remain in fine condition and provide you with continuous service as you care for your patients.

Maintenance of the base unit is recommended after 5 to 8 years of normal use, and cleaning of the gliding plate is recommended periodically. The gliding plate, as well as the table top, may be cleaned with alcohol or household cleaner.

The condensing lenses and mirrors, should be kept dust-free always.